

ONTARIO MINISTRY OF ENVIRONMENT



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1970

## OPERATING SUMMARY

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# CHATHAM

## water pollution control plant

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ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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Chatham : water pollution  
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*Water management in Ontario*

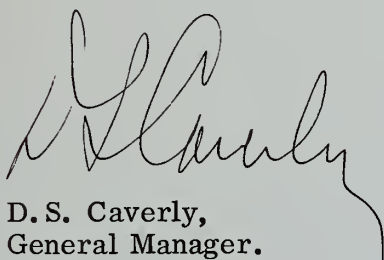
Ontario  
Water Resources  
Commission

135 St. Clair Ave. W.  
Toronto 195  
Ontario


Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water pollution control plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.



D. S. Caverly,  
General Manager.



D. A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.



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135 St. Clair Avenue West  
Toronto 195

**CHATHAM**  
**water pollution control plant**

operated for

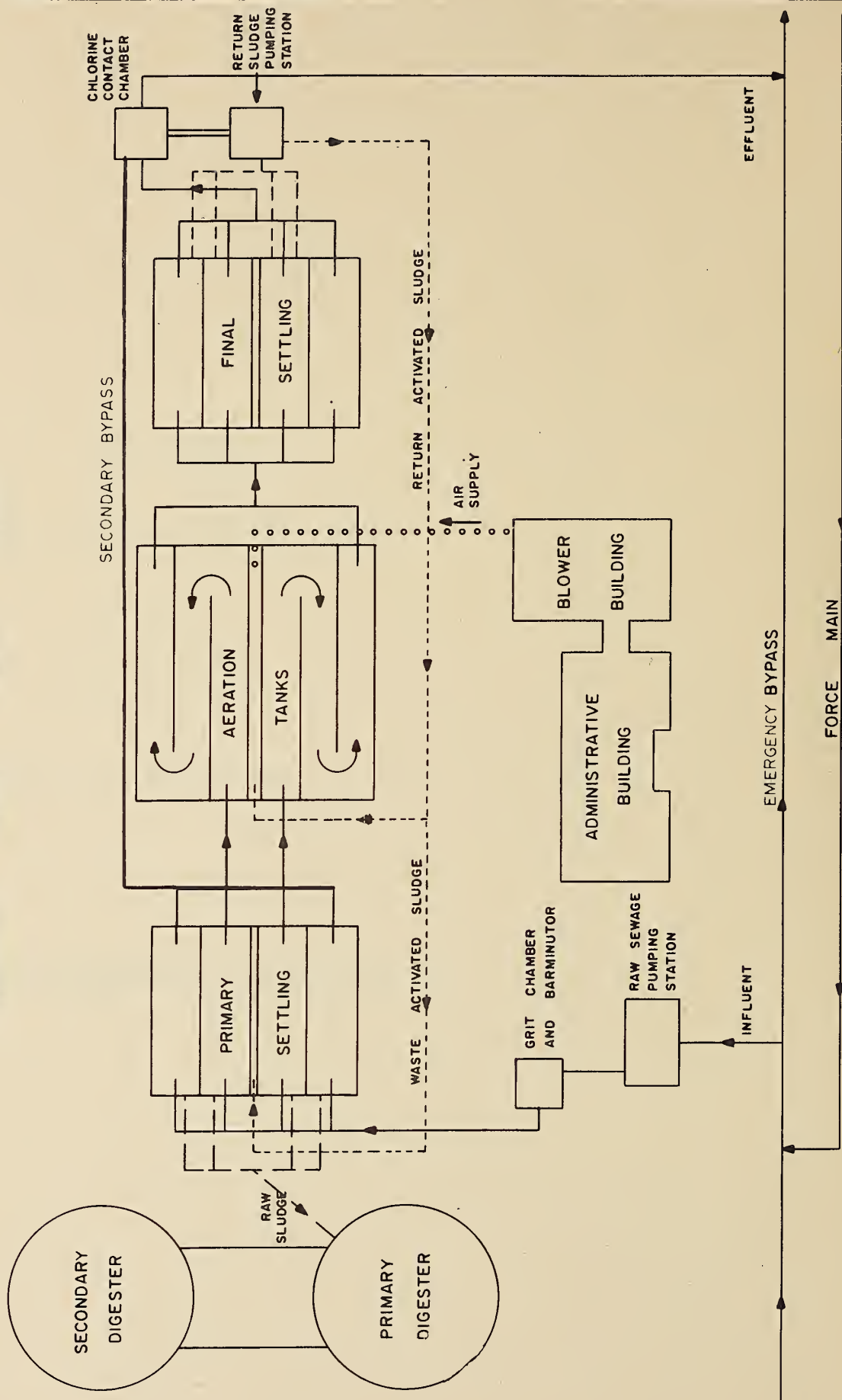
THE CITY OF CHATHAM

by the

ONTARIO WATER RESOURCES COMMISSION

**1970 ANNUAL OPERATING SUMMARY**

## CHATHAM WPCP FLOW CHART



# DESIGN DATA

PROJECT NO.	2-0102-62	TREATMENT	Activated Sludge
DESIGN FLOW	4.5 mgd	DESIGN POPULATION	45,000
BOD - Raw Sewage	250 mg/l	SS - Raw Sewage	250 mg/l
- Removal	90%	- Removal	90%

## RAW SEWAGE

### Screening

- One manually-cleaned bar screen

### Pumps

Type: Worthington  
 Size: Three 3750 gpm @ 47' tdh  
 One 3750 gpm @ 47' tdh  
 (electric & standby diesel)

## PRIMARY TREATMENT

### Grit Removal

Type: Aerated, with clamshell bucket  
 Size: One 27' x 14' x 11 2/3 (avg)  
 (27,450 gal)  
 Retention: 8.8 min  
 Air Supply: One Sutorbilt

### Comminution

Type: Barminutor  
 Size: Two model C

### Primary Sedimentation

Type: Jeffrey, two-pass  
 Size: Two 80' x 32' x 12' (avg)  
 (382,000 gal)  
 Retention: 2.05 hr  
 Loading: Surface, 878 gal/ft<sup>2</sup>/day  
 Weir, 9400 gal/ft/day

## SECONDARY TREATMENT

### Aeration Tanks

Type: Diffused air; triple pass  
 Size: Two 130' x 63' x 14'  
 (1.43 mil gal)  
 Retention: 7.6 hr

### Diffusers

Type: Schumacher tubes  
 125 per pass on 12" centres

### Air Supply

Type: Sutorbilt  
 Size: Three 2500 cfm

### Secondary Sedimentation

Type: Jeffrey  
 Size: Two 120' x 32' x 12' (avg)  
 (574,000 gal)  
 Retention: 3.08 hours  
 Loading: Surface, 586 gal/ft<sup>2</sup>/day  
 Weir, 8780 gal/ft/day

## CHLORINATION

Type: F & P  
 Size: One 2000 lb/day  
 One 400 lb/day

### Chlorine Contact Chamber

Size: One 33.6' x 30' x 10' (62,300 gal)  
 Retention: 22 min

## OUTFALL

- 1,025' to Thames River

## SLUDGE HANDLING

Digestion System - Two-stage  
 Primary--

Type: Gas mixed, fixed cover  
 Size: One 65' dia x 25' (83,000 cu ft  
 or 0.52 mil gal)

Secondary--

Type: Fixed cover  
 Size: One 65' dia x 25' (82,000 cu ft  
 or 0.51 mil gal)

# '70 REVIEW

FLows	DAILY FLOW mil gal	OCCURRING IN THE MONTH OF	MONTHLY FLOW mil gal	OCCURRING IN THE MONTH OF
Average	3.71	—	113	—
High	9.5	April	145	April
Low	1.7	October	89	December

## GENERAL

This project consists of a 4.5 mgd diffused air activated sludge sewage treatment plant with two-stage digestion and liquid sludge disposal, designed to treat 11,250 pounds of BOD per day. Also included are 14 pumping stations -- five prefabricated underground, two on-site, two above-ground, and five other which are owned by the City and operated by the Commission.

The plant occupies six acres of a 76-acre plot in the west end of Chatham downstream and upwind of the City. The remainder of the property was set aside for plant expansion, and 34.5 acres have been used to build a six-cell aerated lagoon designed for the treatment of canning wastes.

## EXPENDITURES

The operating cost for the year was \$158,786.75 or five cents per pound of BOD removed. The cost per million gallons was \$117.19 with the additional unit cost due primarily to increased sludge disposal costs and a substantial reduction in flows.

## PLANT FLOWS and CHLORINATION

The total gallonage treated in 1970 was 1355 million. The plant operated at 82% of hydraulic capacity over the year, at 107% during the peak month and at 211% during the peak day. During the spring runoff period, flows in excess of the secondary treatment capacity received only primary treatment.

During August and September approximately 1 mgd of waste from canning factories was treated in the plant with the remaining cannery waste processed in the aerated lagoons.

From the probability graph, it can be seen that during 1970 the design hydraulic capacity of the plant was exceeded about 20% of the time.

The final effluent was chlorinated from May through October. A total of 32, 110 pounds of chlorine was used at an average dosage of 4.8 milligrams per litre to retain a residual of 0.5 mg/l in the final effluent. The lower dosage requirements resulted from a higher quality secondary effluent.

In addition, 9, 010 pounds of chlorine or 1.9 mg/l was added to the wet well for year round odour control.

### PLANT EFFICIENCY

The average raw sewage strengths in 1970 were 265 mg/l BOD and 266 mg/l suspended solids. The average strengths in the final effluent of 11 mg/l BOD and 8 mg/l suspended solids, represented removal efficiencies of 96% and 97% respectively. The final effluent met the OWRC objectives approximately 90% of the time. This is an improvement over 1969 results and is well above design expectations.

Approximately 3.2 million pounds of BOD and 3.4 million pounds of suspended solids were removed during the year. The primary effluent had an average strength of 127 mg/l BOD and 70 mg/l suspended solids, representing percent removals of 52 and 74 in the primary section of the plant.

The above results are based on 8 and 16 hour composite samples analysed at the plant laboratory.

A total of 83 cu. yds. of grit was removed. This represents a removal quantity of 1.7 cu. ft. per million gallons, which is normal for this type of plant.

### SLUDGE DIGESTION and DISPOSAL

A total of 10.4 million gallons of raw sludge was pumped to the digester and 4.15 million gallons of digested sludge removed. The increase in raw sludge quantities is due to the higher efficiency of the primary section at lower flows.

### AERATION

The average BOD entering the aeration section was 127 mg/l and the average MLSS was 1520 mg/l, resulting in an average loading of 0.23 pounds of BOD per pound of MLSS. An average of 1500 cubic feet of air was supplied per pound of BOD removed.

### CONCLUSIONS

During 1970, the beneficial effects of stricter enforcement of the industrial waste by-laws by the City of Chatham became apparent. The result was lower plant loadings, and improved performance. Plant bypassing, occasionally required in past years to prevent industrial shock loads from upsetting the plant was not necessary during 1970.

The plant continued to produce satisfactory effluent even throughout most of the periods during which it was subjected to hydraulic overloading.

It is anticipated that plant hydraulic capacity expansion will be required in the near future. Plans currently being prepared to provide for the additional flows include increased utilization of the existing aerated lagoon system.

## PROJECT COSTS

2-0102-62 - STAGE I NET CAPITAL COST (Final)	\$2, 615, 831.27
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>1, 845, 135.13</u>
Long Term Debt to OWRC	\$ <u>770, 696.14</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	\$ <u>106, 699.08</u>
Net Operating	\$ 158, 786.75
Debt Retirement	15, 553.00
Reserve	6, 232.40
Interest Charged	<u>43, 179.19</u>
TOTAL	\$ <u>223, 751.34</u>

### RESERVE ACCOUNT

Balance @ January 1, 1970	\$ 28, 103.28
Deposited by Municipality	6, 232.40
Interest Earned	<u>1, 936.37</u>
	\$ 36, 272.05
Less Expenditures	<u>966.48</u>
Balance @ December 31, 1970	\$ <u>35, 305.57</u>

## PROJECT COSTS

2-0102-62 - STAGE II NET CAPITAL COST (Final)	\$813, 322.12
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>504, 317.16</u>
Long Term Debt to OWRC	<u>\$309, 004.96</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	<u>\$ 34, 030.56</u>
Net Operating	\$ -
Debt Retirement	6, 256.00
Reserve	2, 516.73
Interest Charged	<u>17, 312.38</u>
TOTAL	<u>\$ 26, 085.11</u>

### RESERVE ACCOUNT

Balance @ January 1, 1970	\$ 12, 150.25
Deposited by Municipality	2, 516.73
Interest Earned	<u>846.80</u>
	\$ 15, 513.78
Less Expenditures	<u>417.97</u>
Balance @ December 31, 1970	<u>\$ 15, 095.81</u>

## PROJECT COSTS

2-0102-62 - STAGE III NET CAPITAL COST (Final)	\$1, 079, 015. 80
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>773, 301. 54</u>
Long Term Debt to OWRC	\$ <u>345, 714. 26</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	\$ <u>33, 547. 25</u>
Net Operating	\$ -
Debt Retirement	6, 977. 00
Reserve	1, 938. 90
Interest Charged	<u>19, 369. 06</u>
TOTAL	\$ <u>28, 284. 96</u>

### RESERVE ACCOUNT

Balance @ January 1, 1970	\$ 7, 069. 10
Deposited by Municipality	1, 938. 90
Interest Earned	<u>504. 72</u>
	\$ 9, 512. 72
Less Expenditures	<u>243. 13</u>
Balance @ December 31, 1970	\$ <u>9, 269. 59</u>

## PROJECT COSTS

2-0102-62 - STAGE IV NET CAPITAL COST (Final)	\$593,292.79
DEDUCT - Portion financed by CMHC/MDLB (Final)	<u>357,876.24</u>
Long Term Debt to OWRC	<u>\$235,416.55</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	<u>\$ 14,576.02</u>
Net Operating	\$ -
Debt Retirement	4,745.00
Reserve	3,401.68
Interest Charged	<u>13,178.80</u>
TOTAL	<u>\$ 21,325.48</u>

### RESERVE ACCOUNT

Balance @ January 1, 1970	\$ 7,692.32
Deposited by Municipality	3,401.68
Interest Earned	<u>582.21</u>
	\$ 11,676.21
Less Expenditures	<u>264.52</u>
Balance @ December 31, 1970	<u>\$ 11,411.69</u>

## 1970 OPERATING COSTS

• PAYROLL	54 %
• FUEL	< 1 %
• POWER	23 %
• CHEMICALS	2 %
• GENERAL SUPPLIES	2 %
• EQUIPMENT	< 1 %
• REPAIRS & MAINTENANCE	3 %
• SUNDRY	12 %
• WATER	3 %
• TRAVEL	< 1 %

## TOTAL ANNUAL COST

NET OPERATING	71 %
DEBT RETIREMENT	7 %
INTEREST	19 %
RESERVE FUND	3 %

## Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1966	717.1	\$ 89,625.37	\$124.99	5 cents
1967	1130.2	124,134.09	107.93	4 cents
1968	1380.4	137,296.11	99.46	4 cents
1969	1494.0	149,745.68	100.23	4 cents
1970	1355.0	153,786.75	117.19	5 cents

# MONTHLY OPERATING COSTS

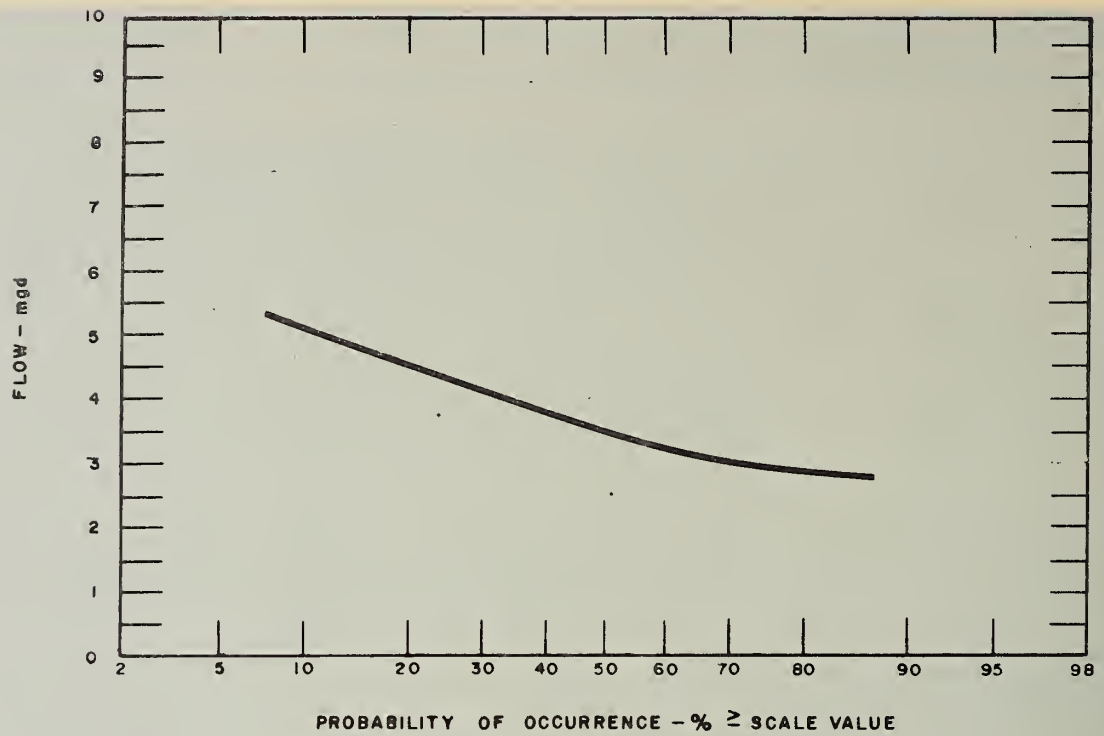
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	* SUNDRY	WATER	TRAVEL
JAN	10408.34	9507.33	-	4.78	225.69	-	53.41	-	9.45	39.75	567.93	-
FEB	11089.63	6873.22	-	92.45	2966.97	-	11.66	68.69	84.57	992.07	-	-
MAR	11805.13	6671.04	-	6.13	2868.96	-	334.25	-	241.57	1018.95	664.23	-
APR	11510.97	6671.04	-	8.83	3151.20	-	456.32	-	-	1223.59	-	-
MAY	13048.55	7045.89	-	3.33	3372.92	-	397.63	-	134.96	1385.44	698.38	-
JUNE	10600.48	6610.01	-	16.80	3572.74	-	133.89	-	-	259.94	-	7.10
JULY	13708.63	6411.97	-	2.05	3399.58	-	214.53	236.93	278.77	2312.41	691.43	160.96
AUG	16291.01	9693.32	-	2.05	3774.13	25.28	187.39	116.55	813.72	1678.57	-	-
SEPT	16532.15	6511.35	-	11.29	3014.47	1220.10	208.90	-	483.89	3828.30	1253.85	-
OCT	12807.10	6420.78	-	-	3386.31	-	221.16	6.82	753.48	2018.55	-	-
NOV	12703.39	6745.27	-	2.05	2803.90	1220.10	264.18	-	632.05	26.09	1009.75	-
DEC	18281.37	5994.16	-	58.57	5324.32	-	992.31	-	991.45	4143.86	776.70	-
TOTAL	158786.75	85155.38	-	208.32	37861.19	2465.48	3475.63	428.99	4423.91	18937.52	5662.27	168.08

BRACKETS INDICATE CREDIT

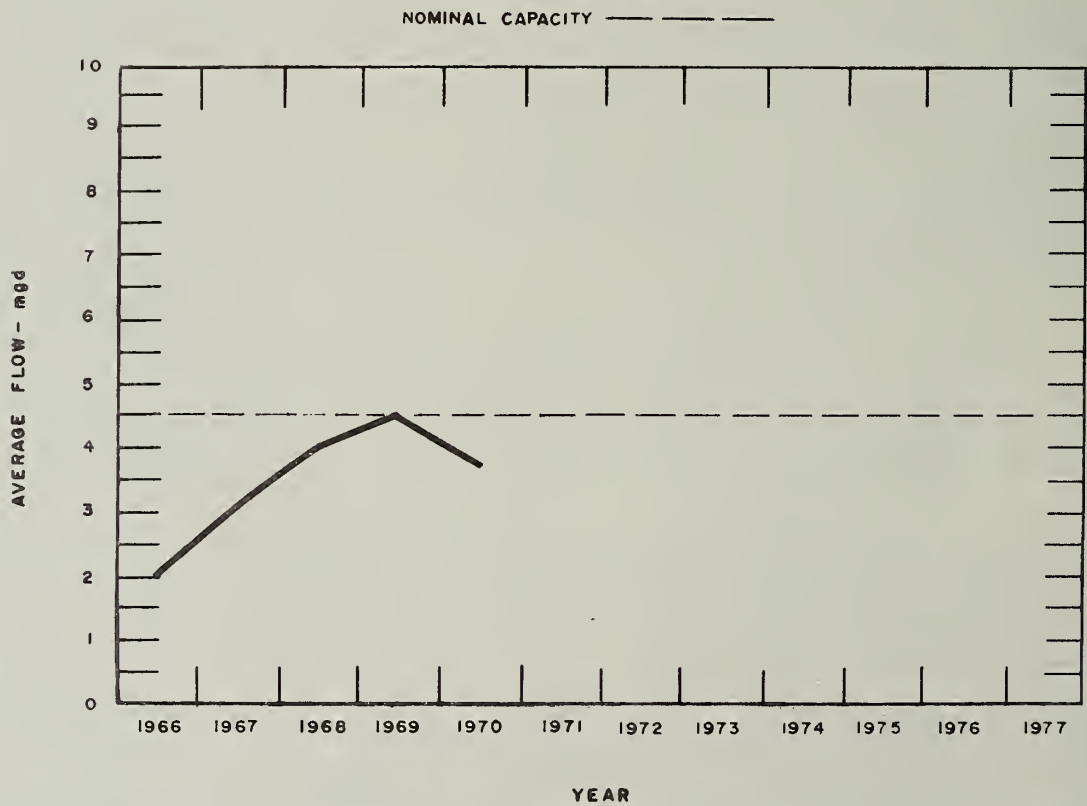
\* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE \$18454.20

Note: Total does not include year-end adjustments.

## PROCESS DATA



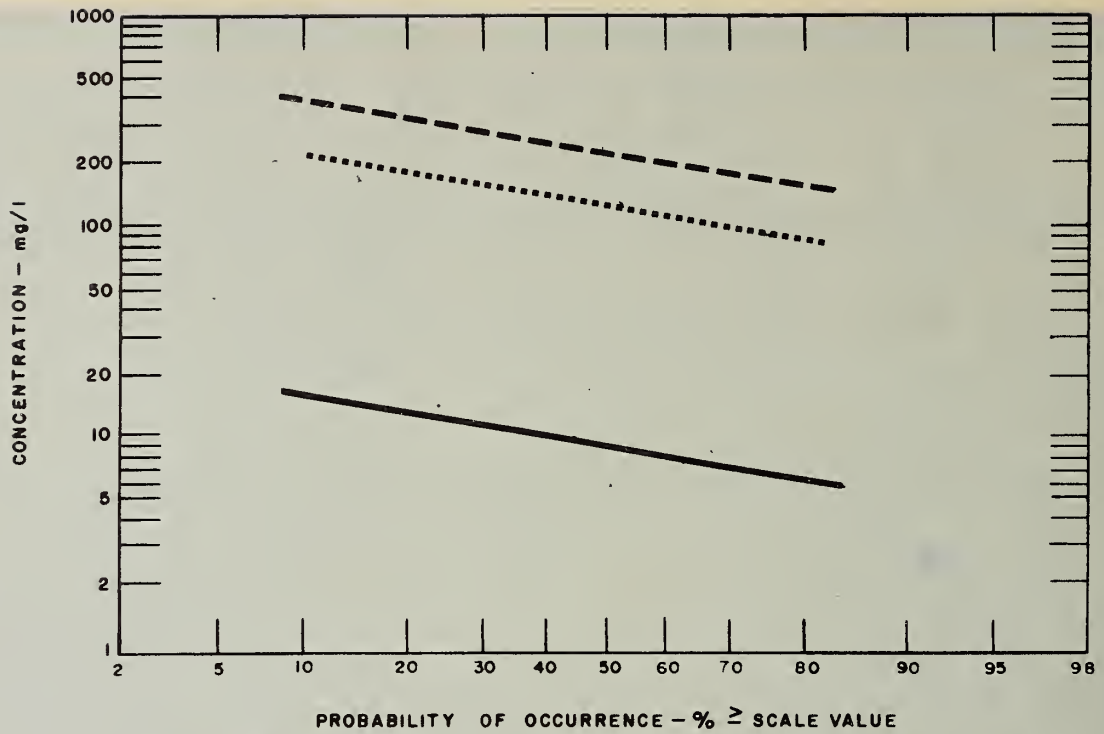
## FLOWS



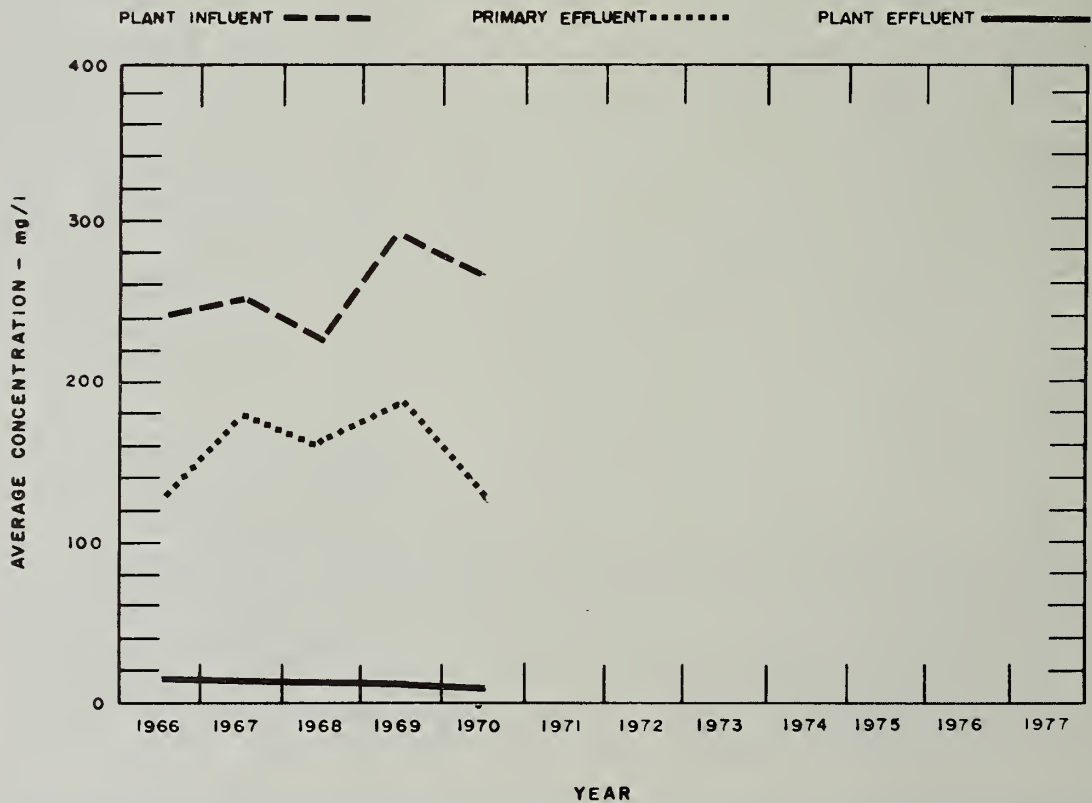
## PLANT FLOWS and CHLORINATION

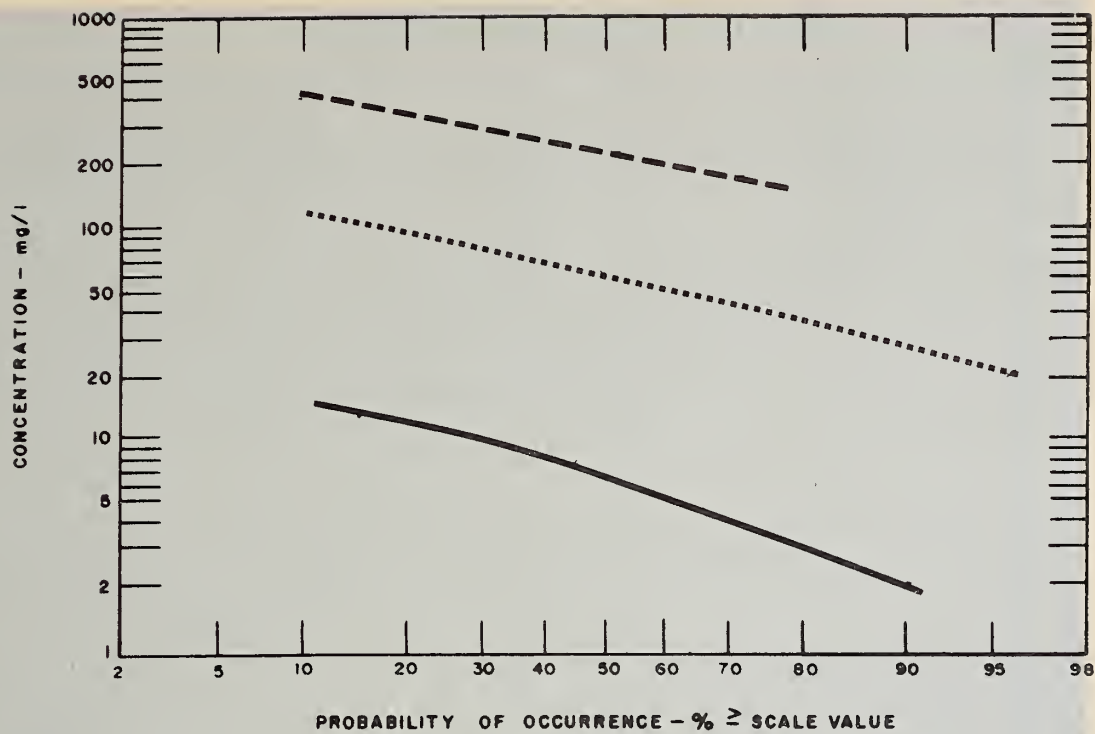
MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10 <sup>3</sup> pounds	DOSAGE mg/l *
JAN	101	3.26	5.9	2.4	-	-
FEB	102	3.64	5.8	2.7	-	-
MAR	131	4.23	7.4	2.5	-	-
APR	145	4.84	9.5	2.4	-	-
MAY	111	3.58	5.1	2.6	7.05	6.4
JUNE	107	3.59	5.3	2.5	7.86	7.4
JULY	110	3.55	6.0	2.4	5.67	5.2
AUG	132	4.26	6.9	2.2	4.80	3.6
SEPT	141	4.70	8.7	2.2	4.08	2.9
OCT	92	2.96	4.8	1.7	2.65	3.4
NOV	94	3.14	7.0	2.1	-	-
DEC	89	2.87	4.6	1.8	-	-
TOTAL	1355	-	-	-	32.11	-
AVERAGE	113	3.71	-	-	-	-

\* During period when chlorination practised.

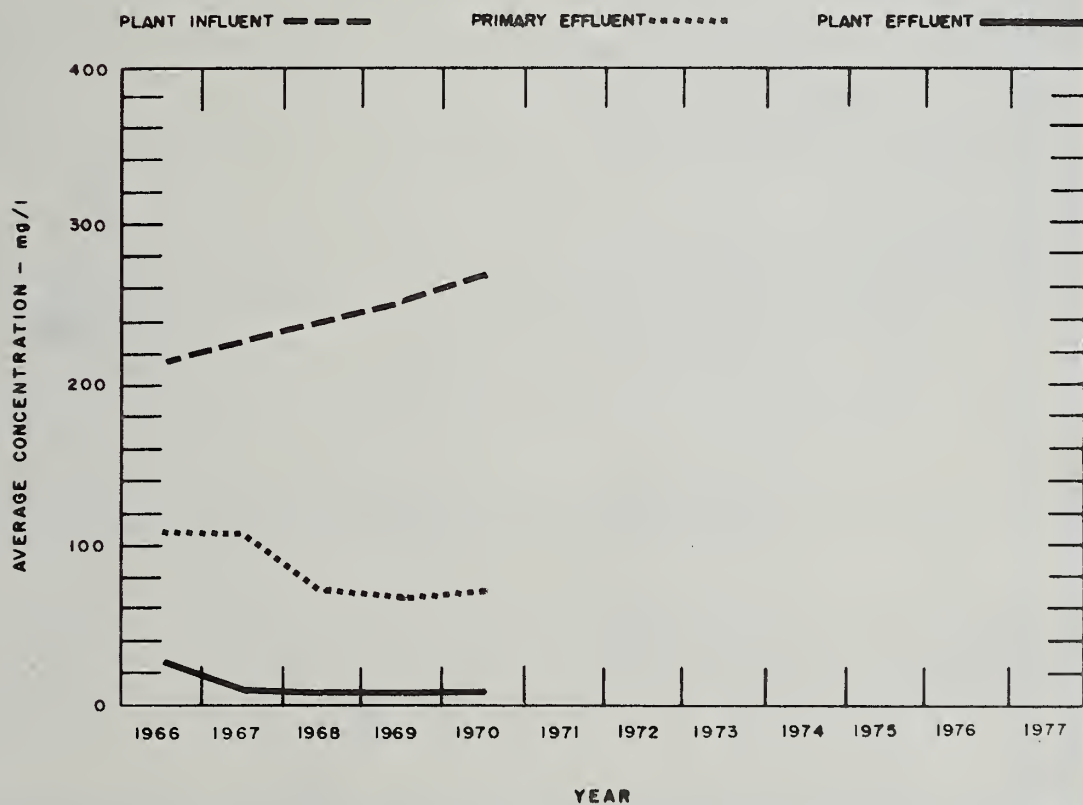


## BIOCHEMICAL OXYGEN DEMAND





## SUSPENDED SOLIDS



## PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND						SUSPENDED SOLIDS						GRIT REMOVED  cu ft
	INFLUENT		EFFLUENT		REDUCTION		INFLUENT		EFFLUENT		REDUCTION		
	n	mg/l	n	mg/l	%	10 <sup>5</sup> pounds	n	mg/l	n	mg/l	%	10 <sup>5</sup> pounds	
JAN	9	442	9	18	96	4.3	22	331	22	13	96	3.2	113
FEB	9	472	9	20	95	4.0	21	454	21	12	97	4.5	115
MAR	7	254	7	6	98	3.2	20	309	20	11	97	3.9	94
APR	6	201	6	16	92	2.7	18	271	18	12	96	3.7	194
MAY	5	233	5	19	92	2.4	21	254	21	16	94	2.6	190
JUNE	7	274	7	9	97	2.8	18	217	18	5	98	2.3	145
JULY	9	229	9	10	96	2.4	22	203	22	6	97	2.2	340
AUG	9	170	8	10	94	2.1	20	184	20	4	98	2.4	277
SEPT	7	166	7	8	95	2.2	17	231	17	6	97	3.2	365
OCT	9	293	9	8	97	2.6	22	211	22	3	99	1.9	120
NOV	7	173	7	7	96	1.6	19	200	19	5	98	1.8	189
DEC	8	182	8	5	97	1.6	22	308	20	3	98	2.7	101
TOTAL	92	-	91	-	-	31.9	242	-	242	-	-	34.4	2243
AVERAGE	-	265 *	-	11*	96	2.7	-	266*	-	8*	97	2.9	189

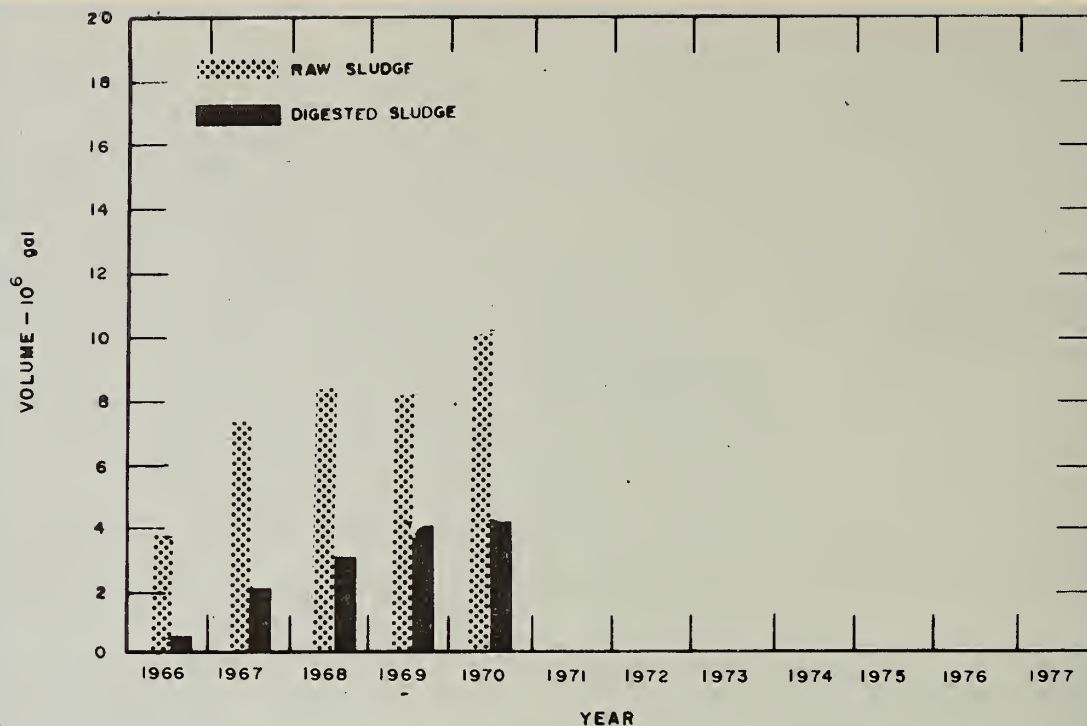
NOTE - n is the number of samples taken

\* - Weighted Average

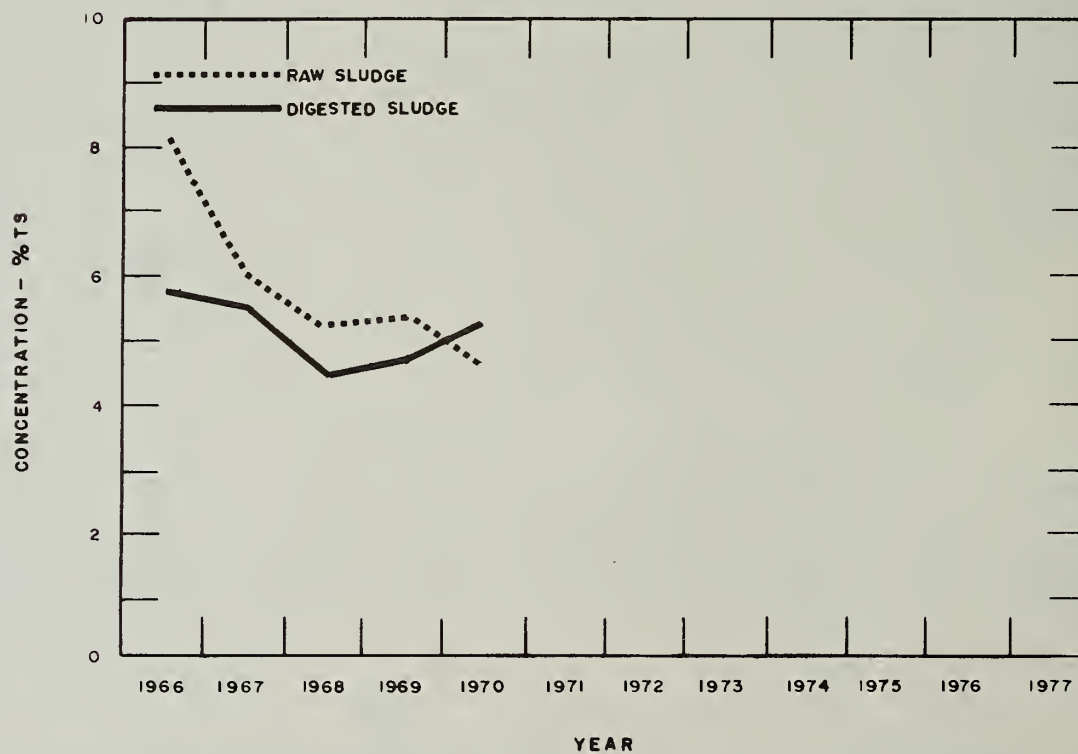
## AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF.		SECONDY. EFF.		MLSS CONCN mg/l	F/M lb BOD lb MLSS	AIR USED 1000 cu ft lb BOD	WASTE SLUDGE 10 <sup>3</sup> lb/day
		BOD	SS	BOD	SS				
		mg/l	mg/l	mg/l	mg/l				
JAN	3.3	197	75	18	13	1370	.33	1.1	1.0
FEB	3.6	164	75	20	12	1480	.28	1.2	1.7
MAR	4.2	181	107	6	11	1360	.39	.8	1.3
APR	4.8	130	97	16	12	1610	.27	1.1	.9
MAY	3.6	146	61	19	16	1430	.26	1.9	1.2
JUNE	3.6	120	57	9	5	1430	.22	2.0	1.2
JULY	3.5	130	61	10	6	1460	.22	2.0	1.9
AUG	4.3	107	41	10	4	1510	.21	1.4	2.0
SEPT	4.7	96	92	8	6	1790	.18	1.4	2.1
OCT	3.0	128	53	8	3	1500	.18	1.6	1.5
NOV	3.1	123	56	7	5	1740	.15	1.6	2.5
DEC	2.9	97	59	5	3	1580	.12	1.9	1.4
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	3.7	127*	70*	11*	8*	1520	.23	1.5	1.6

\* - weighted average



## DIGESTION



## SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME	TOTAL	VOL	VOLUME	TOTAL	VOL	VOLUME	TOTAL	DRYING	LIQUID
	10 <sup>5</sup> gal	SOLIDS %	SOLIDS %	10 <sup>5</sup> gal	SOLIDS %	SOLIDS %	10 gal	SOLIDS %	BEDS cu yd	cu yd
JAN	6.2	5.0	69	2.2	5.6	43	-	-	0	1275
FEB	13.4	5.0	63	2.4	4.7	46	-	-	0	1423
MAR	8.9	6.0	63	2.4	5.7	45	-	-	00	1441
APR	8.3	5.7	62	3.0	7.1	38	-	-	250	1809
MAY	7.2	4.6	62	2.5	6.5	38	-	-	0	1490
JUNE	7.8	4.2	62	2.8	5.7	41	-	-	0	1638
JULY	7.3	5.8	59	3.7	5.6	43	-	-	0	2225
AUG	7.6	4.4	58	3.7	4.8	44	-	-	0	2167
SEPT	8.4	3.7	62	4.9	5.4	42	-	-	0	2879
OCT	7.5	3.3	63	5.1	4.1	45	-	-	0	3028
NOV	11.9	3.8	56	4.1	3.7	46	-	-	0	2405
DEC	9.5	3.7	53	4.7	4.5	44	-	-	0	2791
TOTAL	104.0	-	-	41.5	-	-	-	-	250	24571
AVERAGE	8.8	4.6	61	3.5	5.3	42	-	-	21	2048





**TD  
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1970**

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